Precalc Warm Up # 8-1

Mike takes 4 hours longer than Trent to complete a job. If they work together they can complete the job in 10 hours. How long does it take each of them working alone? Identify variables, set up the equation, then solve.

factorable? discriminant

b^2-4ac

$256-4(1)(-40)$

$256+160$

416

Let t = time it takes Trent to complete the job alone.
t + 4 = time for Mike alone ≈ 22 hrs

$$\frac{(t+4)}{(t+4)}\frac{1}{t}(10) + \frac{1}{t+4}(10)\frac{(t)}{(t)} = 1$$

$$\frac{10t+40+10t}{t(t+4)} = 1$$

LCD: $t(t+4)$

cross products

$$t^2+4t = 20t+40$$

$$t^2-16t-40=0$$

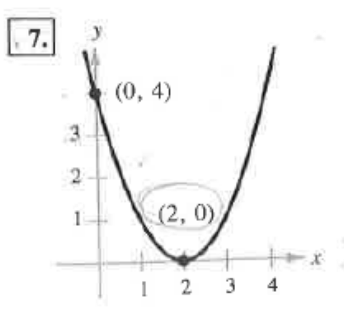
$t \approx 18$ hrs.

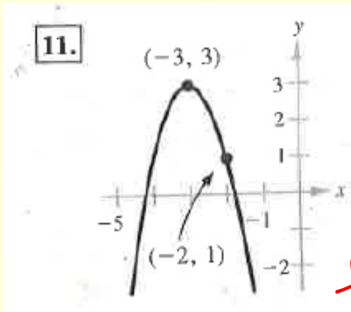
use quad. form.

$$t = \frac{16 \pm \sqrt{416}}{2(1)}$$

HW Questions: p. 180

In Exercises 7–12, find an eq





$y = a(x-h)^2 + k$

$y = a(x+3)^2 + 3$

plug in $(-2, 1)$

for x & y to find a

In Exercises 13–30, sketch the graph of the given quadratic function. Identify the vertex and intercepts.

17. $f(x) = (x + 5)^2 - 6$

19. $h(x) = x^2 - 8x + 16$

23. $f(x) = x^2 - x + \frac{5}{4}$

27. $h(x) = 4x^2 - 4x + 21$

In Exercises 31–34, find the quadratic function that has the indicated vertex and whose graph passes through the given point.

$\boxed{33.}$ Vertex: (5, 12); Point: (7, 15)

$$y = a(x-h)^2 + k$$
$$y = a(x-5)^2 + 12$$

In Exercises 35–40, find two quadratic functions whose graphs have the given x-intercepts. (One function has a graph that opens upward and the other has a graph that opens downward.)

$\boxed{37.}$ (0, 0), (10, 0) $\longrightarrow$ $f(x) = x(x-10)$ opens up

$f(x) = -x(x-10)$ opens down.

Find two positive real numbers where..

+ =

43. The sum of the first and twice the second is 24 and the product is a maximum. outcome

let f = first number

n = 2^{nd} number

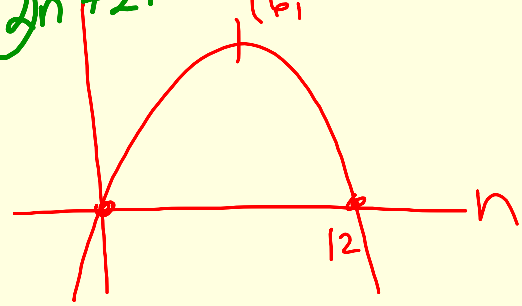
$$f + 2n = 24$$

$$f = 24 - 2n$$

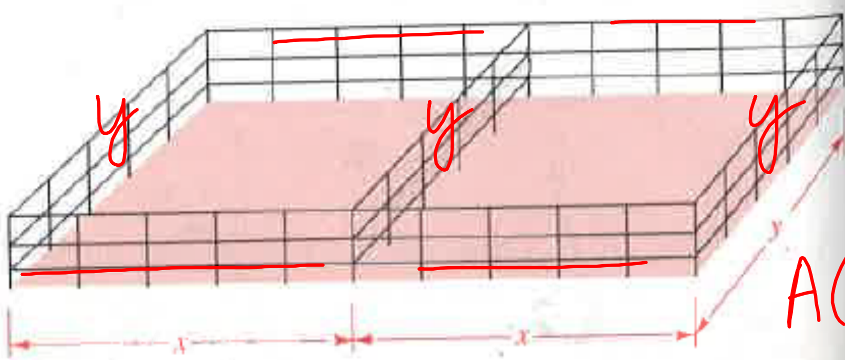
product = fn

$$g(n) = (24-2n)(n)$$

$$g(n) = -2n^2 + 24n$$



47. A rancher has 200 feet of fencing to enclose two adjacent rectangular corrals (see figure). What dimensions will produce a maximum enclosed area?

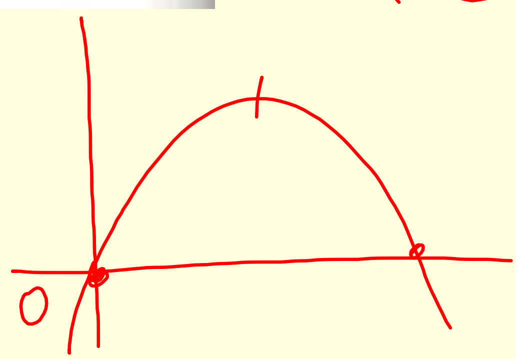


$$A = 2xy$$

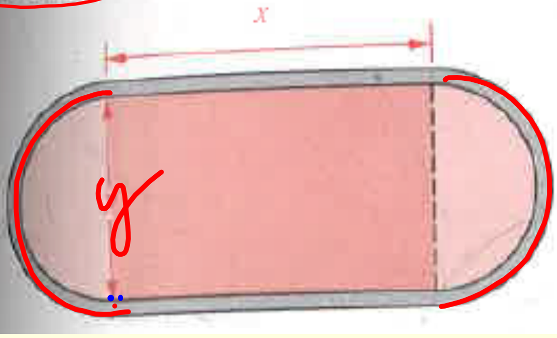
$$A(x) = 2x\left(\frac{200-4x}{3}\right)$$

$$4x + 3y = 200$$

$$\frac{\cancel{3}y}{\cancel{3}} = \frac{200-4x}{3}$$



8. An indoor physical fitness room consists of a rectangular region with a semicircle on each end (see figure). The perimeter of the room is to be a 200-meter running track. What dimensions will produce a maximum area of the rectangle?



$C = \pi d$

$A = xy$

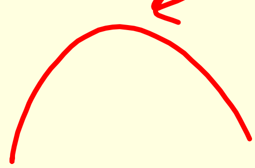
Perimeter

$2x + \pi y = 200$

Solve for y, then plug in

Max at the vertex . . .

$A(x) = x\left(\frac{200-2x}{\pi}\right)$



51. Let x be the amount (in hundreds of dollars) a company spends on advertising, and let P be the profit, where

$P = 230 + 20x - 0.5x^2$

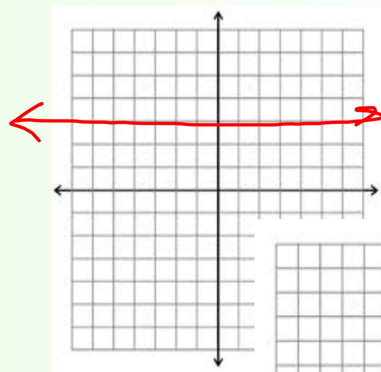
Axis of Symmetry $\frac{-b}{2a}$

What expenditure for advertising gives the maximum profit?

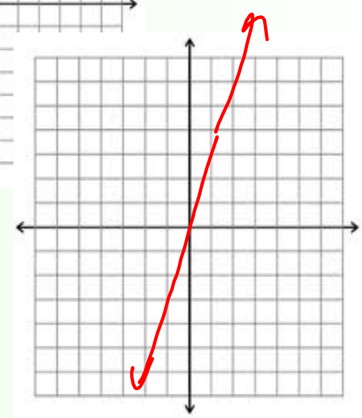
What x

Graphing 0, 1, and 2 degree polynomials:

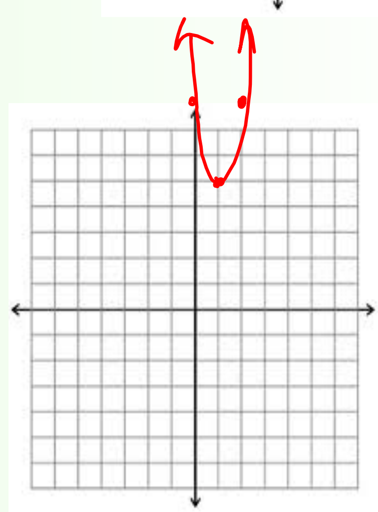
Degree 0 Ex: $f(x) = 3x^0$



Degree 1 Ex: $f(x) = 3x$



Degree 2 Ex: $f(x) = 3(x-1)^2 + 5$



Higher degree polynomials

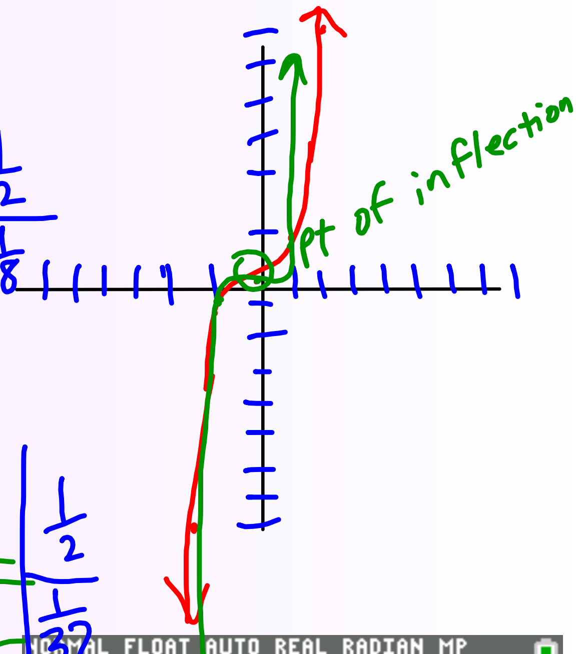
Odd power functions.

$f(x)=x^3$

x	-2	-1	0	1	2	$\frac{1}{2}$
y	-8	-1	0	1	8	$\frac{1}{8}$

$f(x) = (x+2)^3 + 1$ ← up 1

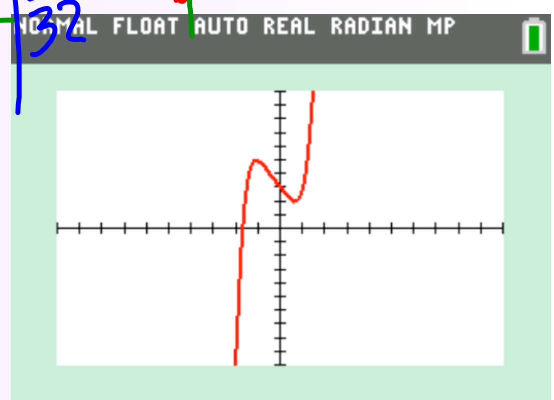
left 2



$f(x) = x^5$

x	-2	-1	0	1	2	$\frac{1}{2}$
y	-32	-1	0	1	32	$\frac{1}{32}$

$f(x) = x^5 + x^4 - 2x + 3$



Describe end behavior

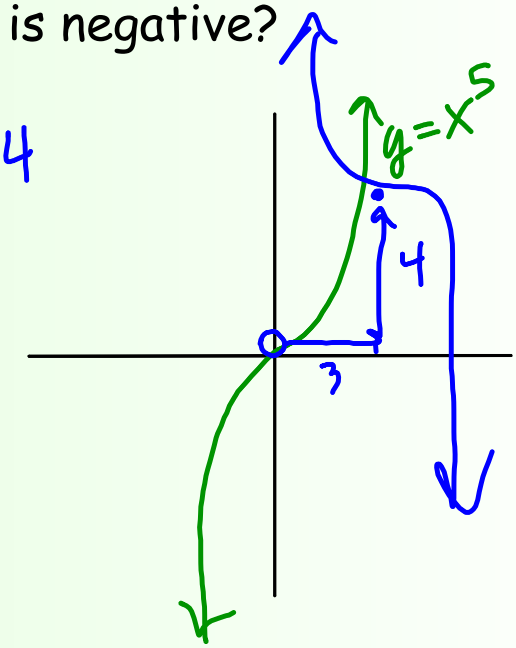
$x \to \infty,\ f(x) \to \infty$

$x \to -\infty,\ f(x) \to -\infty$

What if leading coefficient is negative?

Try $f(x) = -2(x-3)^5 + 4$ ← up 4

R_x vertical stretch   Rt 3



Describe end behavior:

$x \to \infty, f(x) \to -\infty$

$x \to -\infty, f(x) \to \infty$

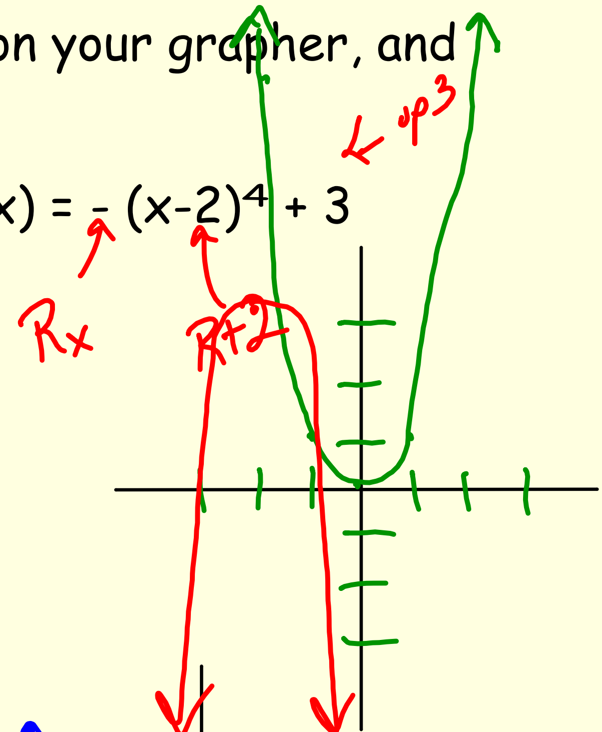
Even powered functions

Graph the functions below on your grapher, and describe end behavior.

$f(x) = x^4$

x	-2	-1	0	1	2
y	16	1	0	1	16

$f(x) = -(x-2)^4 + 3$



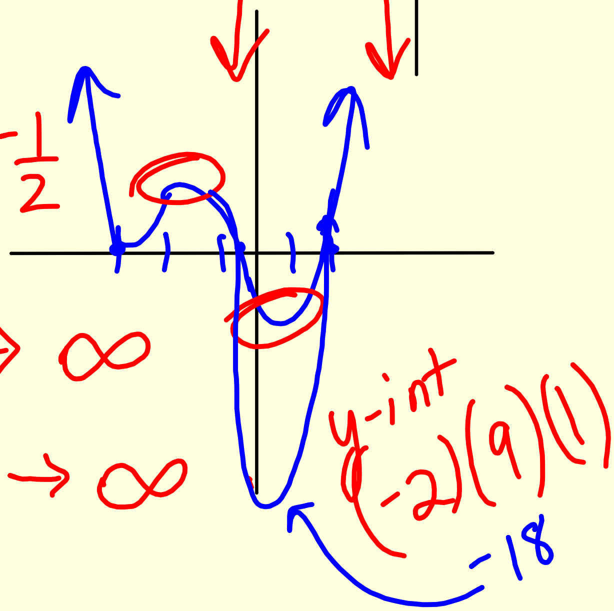
$f(x) = (x-2)(x+3)^2(2x+1)^3$

deg: 6

zeros: $x = 2, -3, -\frac{1}{2}$

$x \to \infty, f(x) \to \infty$

$x \to -\infty, f(x) \to \infty$



And what if leading coefficient were negative? Change one of the above and see what it looks like

Describe end behavior of

$f(x) = ax^n + ...$

$y = x^1$ $\qquad$ $y = -x^1$

n is odd, a is positive

as $x \Rightarrow \infty$, $f(x) \Rightarrow \infty$

as $x \Rightarrow -\infty$, $f(x) \Rightarrow -\infty$

n is odd, a is negative

as $x \Rightarrow \infty$, $f(x) \Rightarrow -\infty$

as $x \Rightarrow -\infty$, $f(x) \Rightarrow \infty$

$y = x^2$ $\qquad$ $y = -x^2$

n is even, a is positive

as $x \Rightarrow \infty$, $f(x) \Rightarrow \infty$

as $x \Rightarrow -\infty$, $f(x) \Rightarrow \infty$

n is even, a is negative

as $x \Rightarrow \infty$, $f(x) \Rightarrow -\infty$

as $x \Rightarrow -\infty$, $f(x) \Rightarrow -\infty$

How many turning points, and how many zeros can an nth degree polynomial have?

deg: 3

Ex: $f(x) = (x-2)(x+5)(x - 4)$ has 2 turning points At most

and 3 zeros. At most

In the above example, find

the zeros

$x = 2, -5, 4$

the solution when $f(x) = 0$

$0 = (x-2)(x+5)(x-4)$

$x = 2, -5, 4$

the factors

$(x-2)(x+5)(x-4)$

the x-intercepts

$(2,0)(-5,0)(4,0)$

Ex: $f(x) = (x-2)^2(x+5)^3(x - 4)^5$ has __9__ turning points at most

and __10__ zeros. At most

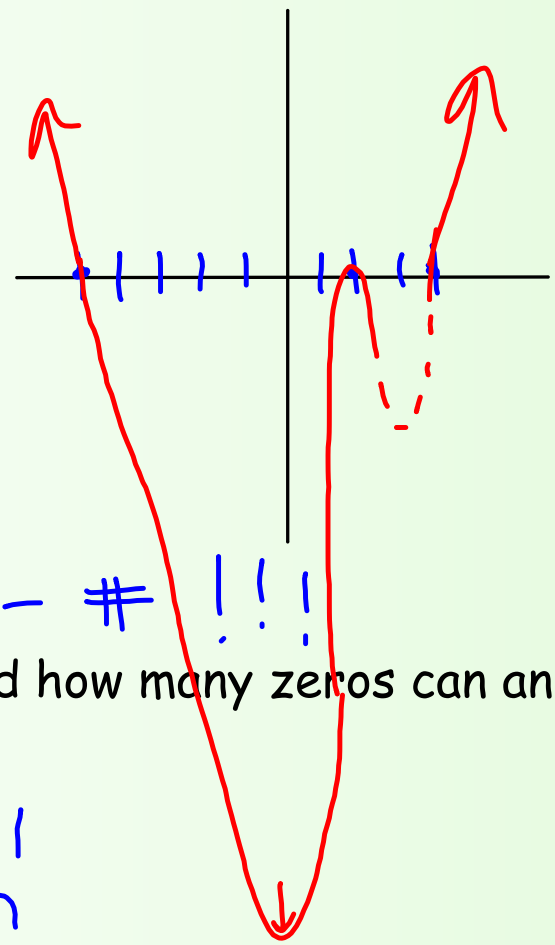
deg: 10

Zeros? $x = 2, -5, 4$

y-int? $(0,$

$(-2)^2(5)^3(-4)^5$

really big $-$ # !!!



How many turning points, and how many zeros can an nth degree equation have?

max # turns $= n-1$

max # zeros $= n$

Find all of the real zeros of $f(x) = x^4 + x^3 - 5x^2 - 5x$

$$f(x) = x((x^3 + x^2)(-5x - 5))$$

$$x(x^2(x+1) - 5(x+1))$$

$$f(x) = x(x^2 - 5)(x+1)$$

$$x = 0, \pm\sqrt{5}, -1$$

Find a polynomial with zeros at -1/3, 4, 0

$$x = -\frac{1}{3} \qquad x = 4 \qquad x = 0$$

$$3x + 1 = 0$$

$$f(x) = (3x+1)(x-4)\,x$$

HW: PC Book

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